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# Data stream ensemble in a new health application for stress management at work: the case of Streblo

Ezekiel Chinyio –Silvia Riva  
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Digital Health  
April 24-25, 2019 Houston | USA  
Theme: An Innovative Bridging in Modern Healthcare

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## Index

- \* Context
- \* Stress in organisations and its consequences
- \* E-Health application
- \* Datafication and WEKA
- \* Streblo app: features

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## The University of Wolverhampton (UOW)

- \* Dating back nearly 190 years.
- \* Has approximately 23,000 students and 2,500 staff .
- \* UK top-5 for graduate employability for similar sized institutions.
- \* Nationally leading in the development of students for professional and vocational careers.
- \* €275million is being invested in education, training and support of economic growth.



## The University of Wolverhampton (UOW)

- \* Three main campus sites.

Four faculties:

1. Faculty of Social Sciences;
2. Faculty of Arts;
3. Faculty of Education, Health and Wellbeing
4. Faculty of Science and Engineering (FSE).



## The University of Wolverhampton

### The FSE has

- \* Around 200 academics, technical and administrative staff.
- \* Around 5,000 students.
- \* Courses at: foundation degree, HND, BSc, BEng, MEng and MPharm & MSc and PhD levels.
- \* Six schools; including the School of Architecture and the Built Environment (SoABE).
- \* The presenters are from the 'Smart, Sustainable and Healthy Cities' research group of the SoABE.



## Examples of cross-disciplinary research at the FSE

1. No. 2018-1-UK01-KA203-048246: Health Research-Based Innovative Open Educational Resources and Tools for Lighting Design Students and Professionals – LIGHT4HEALTH
2. No. 703236: INhibiting STress IN the ConsTruction Industry (INSTINCT ) project



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# Stress in organisations and its consequences

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## A DEFINITION OF STRESS



*“Stress refers to the physiological and psychological arousal that follows when a person identifies a menace to something of value to him/her and that menace consumes the resources he/she has available to cope with it “(Hobfoll, 1989; Lazarus and Folkman, 1984)*

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# Stress in organisational settings

- \* High levels of stress at work, great responsibilities, hazards and lack of balance between tasks and deadlines are common in the daily lives of many workers

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# Stress at the workplace

1. stress associated with the nature of the task itself (e.g. *complexity*) or with the conditions of the task (e.g. *limited time, poor working conditions*)
2. stress associated with interpersonal relationships of the organisations (e.g. *conflict, incomprehension*).

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# The formula of stress



$$S = P > R$$

Stress occurs when the pressure is greater than the resources

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# Types of stressors



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- \* The effects of stress on morale and workplace activities can be devastating.
- \* Employees can become unfocused, distant, and unmotivated.
- \* Teamwork may also breakdown

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## 2) Decreased productivity

- \* High stress at work will impact on productivity levels (e.g. workers do not want to work outside)
- \* No respect of deadlines

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## 3) Increased distraction

- \* More risks to adopt unsafe behaviours (e.g. not using the hardhat)
- \* Exposition to several physical risks (e.g. working in unsafe locations)

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## 4 ) Increased workplace conflicts

- \* People that are stressed are not able to communicate well
- \* Difficulty to cooperate with colleagues closely for long periods of time (*peculiar aspects of construction workers*)

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## How to cope?

Changing the patterns of thinking and behaviours is not an easy mission, and it requires constant support, learning and determination.

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## e-health

E-health applications can contribute to this change through their ability to foster continuous interaction with the user.

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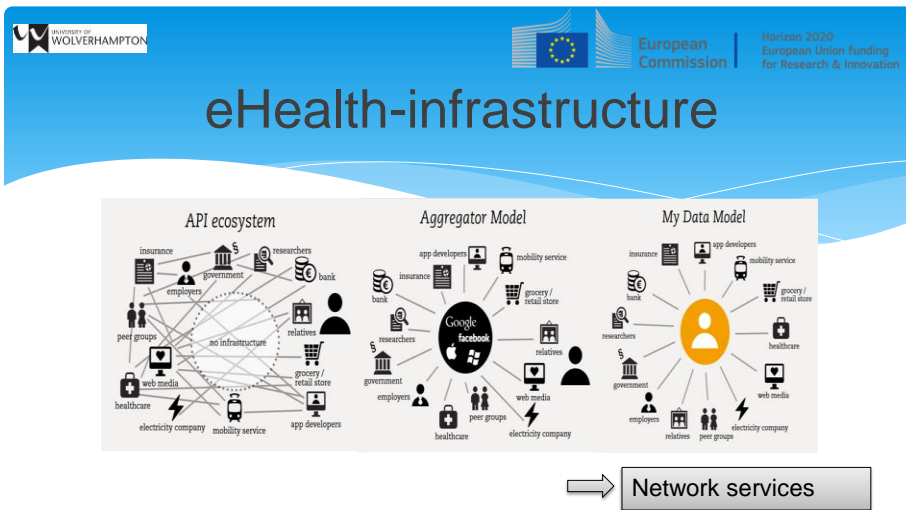
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## E-Health applications

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Slide taken out from prof. Minna Pikkarainen, University of Oulu, "The Digital Health Revolution"

Lähde (muokattu): Poikola, Kuikkaniemi & Honko. 2015. MyData - A Nordic Model for human-centered personal data management and processing.

Suom.: MyData - johdatus ihmiskeskeiseen henkilötiedon hyödyntämiseen

Saatavilla LVM:n sivuilla: <https://www.lvm.fi/documents/20181/859937/MyData-nordic-model/2e9b4eb0-68d7-463b-9460-821493449a63?version=1.0>



## How eHealth applications work



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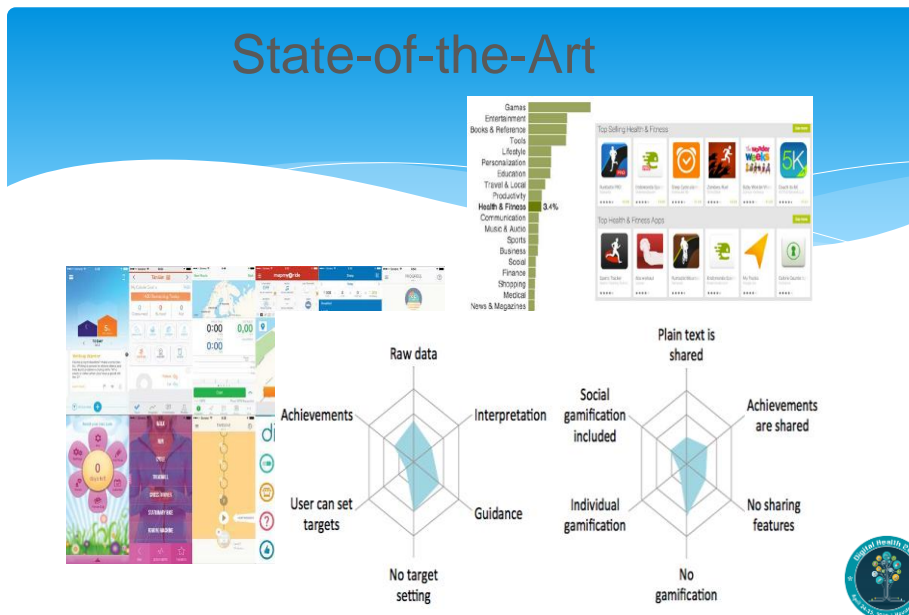




- \* Mobile phone apps have shown promising results in the field of 'e-health and wellbeing'.

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European Commission (EC) project H2020-MSCA-IF-2015/H2020-MSCA-IF-2015, Grant Agreement: 703236 – 'Inhibiting Stress in the Construction Industry' (INSTINCT)

Häkkinen, J., Colley, A., Inge, V., Alho, M., Rantakari, J. (2015). Exploring Digital Service Concepts for Healthy Lifestyles. In Proc. HCI International 2015, Springer.



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# Design

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# Mobile designs

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- \* Datafication is a process of transforming diverse processes, qualities, actions and phenomena into forms that are machine-readable by digital technologies.
- \* Datafication allows things, relationships, events, processes to be examined for patterns and insights, often today using technical processes such as data analytics and machine learning

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## Conceptualisation of Streblo

Figure 2: Conceptualisation of Streblo

- Linking Personality traits to level of stress
- Linking the level of stress with coping strategies

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## What is WEKA?

- \* **Waikato Environment for Knowledge Analysis**
  - \* It's a data mining/machine learning tool developed by the Department of Computer Science, University of Waikato, New Zealand.
  - \* Weka is also a bird found only on the islands of New Zealand.






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# Explorer: building “classifiers”

- \* Classifiers in WEKA are models for predicting nominal or numeric quantities
- \* Implemented learning schemes include:
  - \* **Decision trees** and lists, instance-based classifiers, support vector machines, multi-layer perceptrons, logistic regression, Bayes’ nets, ...

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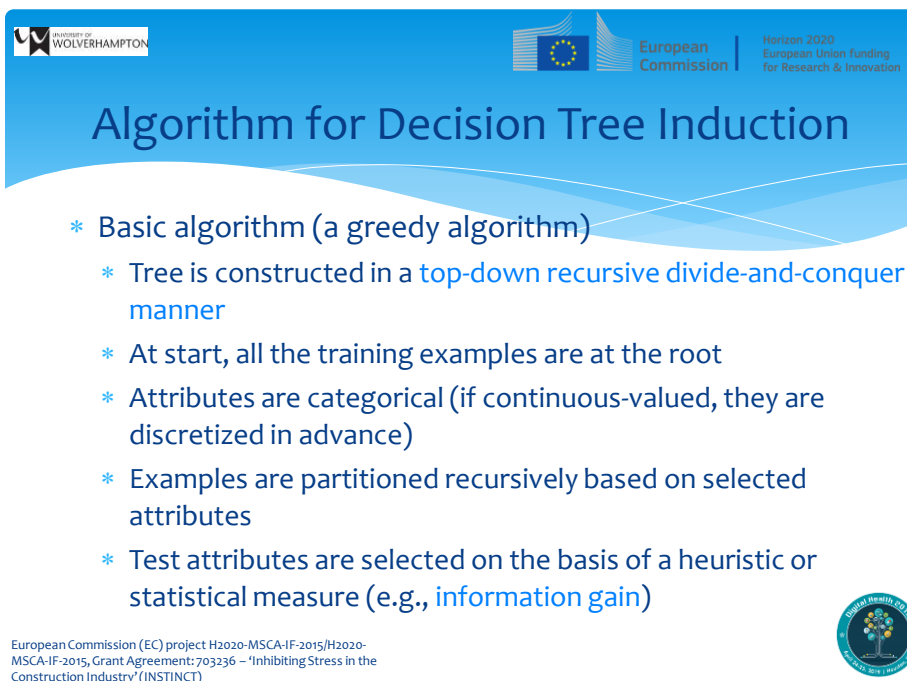
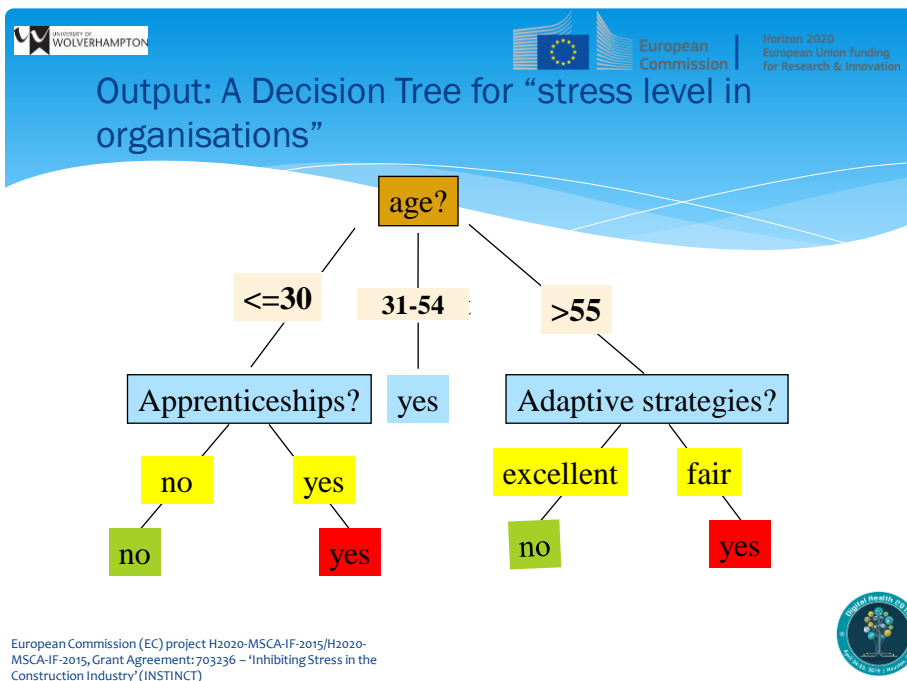
## Decision Tree Induction

age	income	office-based	adaptive strategies used	currently stressed
<=30	high	no	fair	no
<=30	high	no	excellent	no
31-54	high	no	fair	yes
>55	medium	no	fair	yes
>55	low	yes	fair	yes
>55	low	yes	excellent	no
31-54	low	yes	excellent	yes
<=30	medium	no	fair	no
<=30	low	yes	fair	yes
>55	medium	yes	fair	yes
<=30	medium	yes	excellent	yes
>55	medium	no	excellent	yes
>55	high	yes	fair	yes
31-54	medium	no	excellent	no

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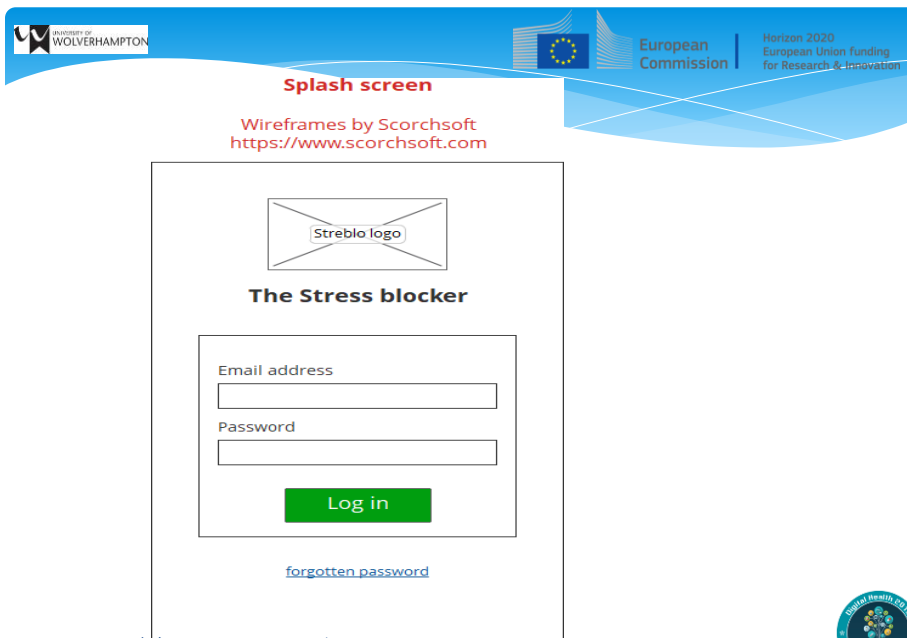






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### Intro screen

Introduction

progress bar indicates how far through the entire process they are

**Streblo logo**


Streblo works out your personality type and stress levels to provide customised advice on how to reduce your stress levels.

We will ask you a series of questions. The process will take approximately 10 minutes.

**Get Started**

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### Personality Question Format

10 different questions are asked in order using the following format

Personality questions (1 of 10)


I see myself as someone who  
is reserved

☒ Disagree strongly  
☐ Disagree a little  
☐ Neither agree nor disagree  
☐ Agree a little  
☐ Agree strongly

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### Stress Question Format

10 different questions are asked in order using the following format

How much are you stressed questions (3 of 10)

In the last month, how often have you felt nervous and "stressed"?

☒ Never  
☐ Almost never  
☐ Sometimes  
☐ Fairly often  
☐ Very often

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### Your personality analysis

Your personality traits

**▼ Openness to experience**  
**▼ Conscientiousness**  
**▲ Conscientiousness**  
 (efficient/organized vs. easy-going/careless). A tendency to be organized and dependable, show self-discipline, act dutifully, aim for achievement, and prefer planned rather than spontaneous behaviour. High conscientiousness is often perceived as stubbornness and obsession. Low conscientiousness is associated with flexibility and spontaneity, but can also appear as sloppiness and lack of reliability.  
**▼ Agreeableness**  
**▼ Neuroticism**

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### Your stress analysis

10 different questions are asked in order using the following format

Your stress level

Your stress score is:

**28 out of 40**

You are considered to be under high perceived stress

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0-13 is green  
14-26 is yellow  
27-40 is red

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### Stress coping exercises

Final additional exercises are the same for everyone

Take action: Your stress exercise

**The breath exercise**

This is a simple exercise to center yourself and connect with yourself. Practice it throughout the day, especially any time you find yourself getting caught up in your thoughts and feelings.

- Take ten slow, deep breaths. Focus on breathing out as slowly as possible until the lungs are completely empty—and then allow them to refill by themselves.
- Notice the sensations of your lungs emptying. Notice them refilling. Notice your navel rising and falling. Notice the gentle rise and fall of your shoulders.
- See if you can let your thoughts come and go as if they're just passing cars, driving past outside your house.
- Expand your awareness simultaneously notice your breathing and your body. Then look around the room and notice what you can see, hear, smell, touch, and feel.

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Take action: Additional exercise (1/3)

**Five Minutes exercise**

What can you accomplish in five minutes? Sometimes, important things:

- Return an e-mail.
- Make an appointment.
- Leave a voicemail message.
- Write a page of text.
- Create an agenda for a meeting.
- Research a point.
- Write a thank-you note.
- Locate a missing source.
- Ask a colleague a question you need the answer to.
- Read a short message.
- Clarify something you were unclear about.

Often, if you can promise yourself to devote the next five minutes to a task, you'll find that it stretches into 10 or 15 minutes and you accomplish more than you thought you might when you began.

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Take action: Additional exercise (2/3)

**The exercise of "What's Important?"**

How do you decide the relative importance of various tasks? Below are five criteria by which you can weigh tasks

When assigning them priorities:

- high payoffs, which tasks will provide the best return on investment for your time and energy?
- Essential to your goals. Which tasks are absolutely critical for meeting personal and professional goals?
- Essential to your company's goals. Which tasks will most benefit your company, providing it with the best return on investment for employing you?
- Essential to your boss's goals. Which tasks does your boss regard as most important?
- Can't be delegated. Which tasks can be done only by you? These will be high priorities.

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Take action: Additional exercise (3/3)

**The exercise How to Say No**

Psychologists have identified a four-step procedure that makes saying no safe, diplomatic, and effective:

- Give a reason. To simply decline to do something seems arbitrary, lazy, or irresponsible. If you give a good, solid reason for your decision, it will show that you're reasonable.
- Be diplomatic. Saying no can hurt, upset, or even anger the person to whom you're saying

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Text here changes depending on the stress score

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### Final message

Final message

**Thank you!**


All the solutions were formulated by a trained team of academics working in Psychology and in Organisational settings from the University of Wolverhampton, West Midlands, UK

**Questionnaires used were:**  
 Rammstedt, B. & John, O. P. (2007). Measuring personality in one minute or less: A 10 item short version of the Big Five Inventory in English and German. *Journal of Research in Personality*, 41, 203-212  
 Cohen, S., Kamarck, T., & Mermelstein, R. (1994). Perceived stress scale. *Measuring stress: A guide for health and social scientists*, 235-283.  
**Solutions were taken from:**  
 Harris, R. (2009). *ACT made simple*. Oakland, CA: New Harbinger.  
 Mancini, M., & Mancini, M. (2003). *Time management*. New York: McGraw-Hill.

< Back   **Start again**

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# Streblo is focused on Adaptive strategies

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# Problem solving

- \* *Problem solving planning denotes the ability to self-manage, and face problems and their consequences willingly*

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# Problem solving

- \* For example, workers having a high work overload (e.g. too many tasks and time deadlines for project managers) **can manage their time differently**, and use **resource allocation to condense their workload**.



- \* This coping skill was identified to be useful for improving the job performance (Yip et al., 2008).

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# Positive reappraisal

- \* *Positive reappraisal is defined as the ability to reframe work-related difficulties by giving a different meaning to them and focussing on personal growth and emotional control which workers may obtain from their experience*

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# Positive reappraisal

- \* People using this coping skill learn to reconsider stressful events or problems arising in projects so that they recognise themselves as able to reinforce their personal capabilities.



- \* Positive reappraisal is often used as an effective strategy to experience more positive emotions (Rivera, 2008)

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# Confrontive coping

- \* *Confrontive coping is defined as specific antagonistic efforts to reframe a stressful situation or context and it comprises a certain dose of opposition and risk taking behaviour*

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# Confrontive coping

- \* In organisational contexts, workers may adopt this coping skill when their projects show inadequate resources and they want to propose to their superiors or advisors a means of re-allocation these resources (Melia et al., 2008).

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# Instrumental support seeking

- \* *Instrumental support seeking is a strategy used when a person is looking for instrumental advice or assistance from groups such as collaborators, associates or colleagues*

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# Instrumental support seeking

- \* Work-team is characterised by frequent exchanges with other colleagues and it is quite common to refer to some colleagues for assistance in some areas of work or to solve some problematic issues being faced during projects.



- \* The use of instrumental support seeking can actually improve teamwork, resulting in better implementation of projects and getting better outcomes (Agumba & Fester, 2010; Conchie et al, 2013.).

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# Acceptance of responsibility

- \* *Acceptance of responsibility is the ability of each employee to recognise his or her own role in the project, and accept responsibility for the possible problems that may arise*

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# Acceptance of responsibility

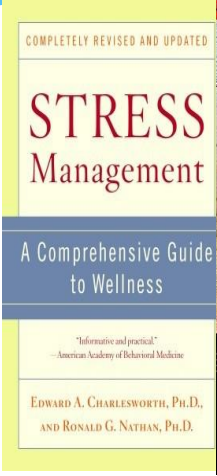
- \* Project managers may take responsibility for reassessing the time and deadlines of the projects in which they are primarily involved so as to direct better the process towards ending successfully (Yip et al., 2008; Chan et al., 2014; Chan et al., 2016).

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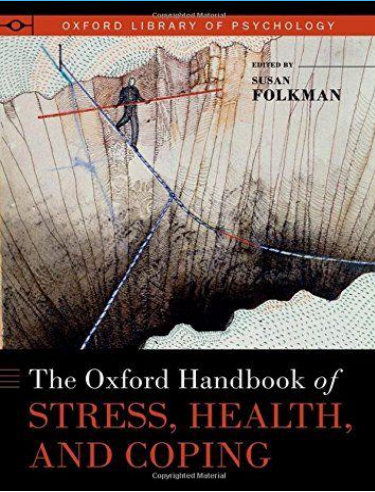
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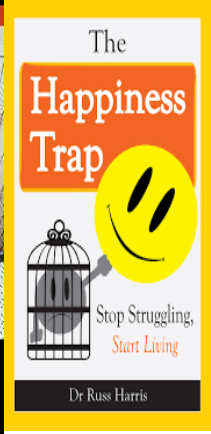
The solutions proposed are very functional and based on recent review of academic literature



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# Thank you for your attention



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# ICDH



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